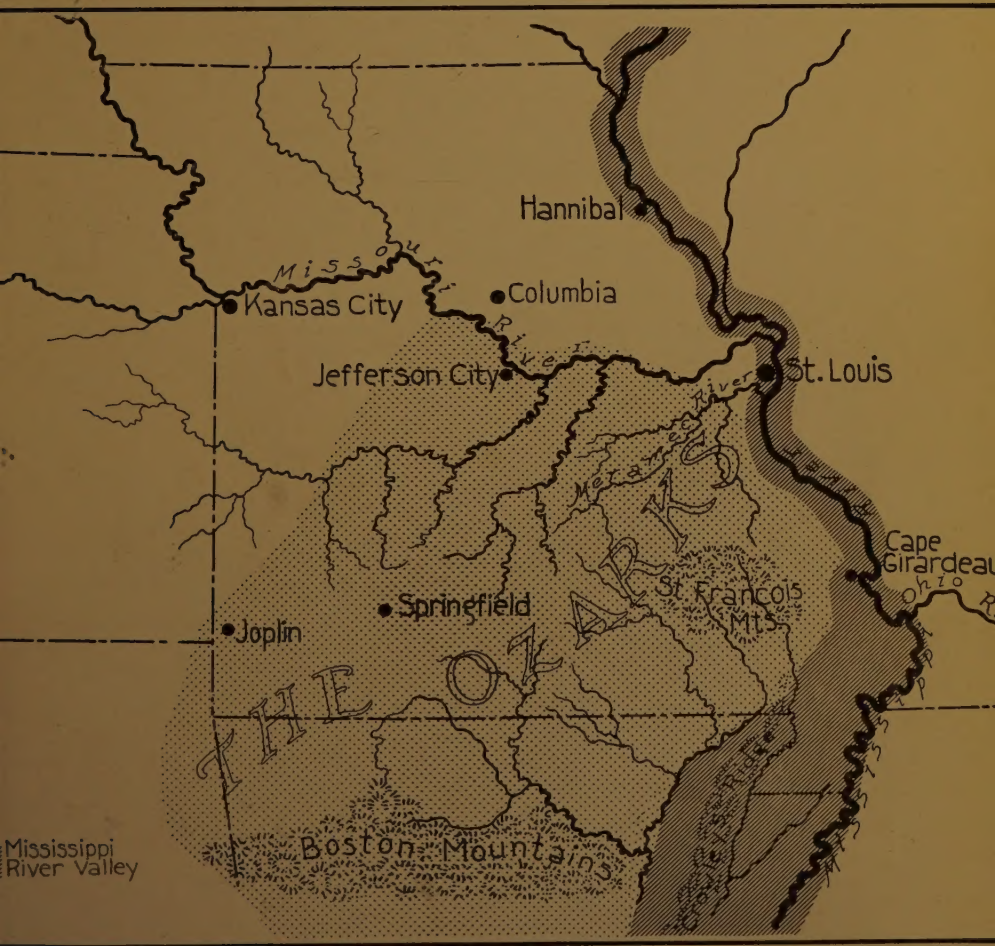
Spring Flowers of Missouri and How to Know Them



MISSOURI BOTANICAL GARDEN BULLETIN
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A greatly enlarged picture of *Erigenia bulbosa* (Pepper and Salt). See the tailpiece for a habit sketch showing how these plants bloom down among last years' dry oak leaves.

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SPRING FLOWERS OF MISSOURI AND HOW TO KNOW THEM

EDGAR ANDERSON, DRAWINGS BY BERNADETTE VELICK

HOW TO USE ANY GOOD BOOK ABOUT WILD FLOWERS

THE average St. Louis amateur who buys a copy of Steyermark's SPRING FLORA OF MISSOURI takes it home thinking "Now when I spend a weekend in the Ozarks I'll have a book which will tell me all those plants I don't know". If the amateur is really interested at all, this is the very worst way to use the book. There are something like a million kinds of flowering plants in the world; no book is going to be able to help anyone identify very many of them right off. The best way to use any good book about wild flowers is to STUDY THE PLANTS YOU ALREADY KNOW.

Surely you know a buttercup when you see it. Well, look up BUTTERCUP in the index and you will find that Missouri has more kinds than you probably suspected. Now put the book aside and sit down and spend at least half an hour studying your special buttercup—the leaves, the flower, the stem. A reading glass or a hand lens will help you. Never mind if you do not know any names for the various parts of the flower; anything which you find on more than one plant is probably significant. You will find this half hour rewarding in many ways. The plants you live with have more variety and charm than you ever suspected before you took a really good look at them.

With this experience behind you turn back to Dr. Steyermark's invaluable book. Look at the pictures and see if you can decide from them just *which* Missouri buttercup you have in your hand. Then read what he has to say about it. Read what he has to say about buttercups as a whole—the genus Ranunculus. Some of the fancy words he uses will be new to you. Look up their meaning; you're going to run into them again. After having looked for half an hour at strange little things in the flower with no name in your head to pin them down with, it will be a relief to find such useful concepts as CARPEL, SEPAL, and PISTIL. Never mind if you cannot yet make out what every word means. Have you ever tried to read a foreign newspaper? If you have, you know it is possible to read along in a foreign language skipping over the words you don't know or only half way understand and still get a good deal out of the account. You will also have learned that it pays to sit down from time to time with a good dictionary and look up those words which keep recurring and that do not mean anything at all to you.

Set yourself a simple goal. Every time you go to the country look up one plant you know. Spend the weekend learning all you can about this fellow-Missourian you previously took so much for granted. After about five or six such sessions you will find you

are seeing plants with a new eye. It will be as if you had previously gone through the world with Vaseline smeared over your glasses. Having really looked at a Dog-tooth Violet and learned why it was in the Lily Family, you will understand the Wild Hyacinths when they open, and will surprise yourself by saying "Why, I do believe that must be in the Lily Family". Next summer when you go out to the Rockies you will find few of the plants which are in Dr. Steyermark's book but if you have spent ten week-ends studying ten plants that you thought you knew AND REALLY GOT TO KNOW THEM, you will find that though the Rocky Mountain flowers are strangers, they are mostly close relatives of old friends. You will have the satisfying feeling of knowing your way around. Your best teacher is yourself.

THE LANGUAGE FOR THE FLOWERS

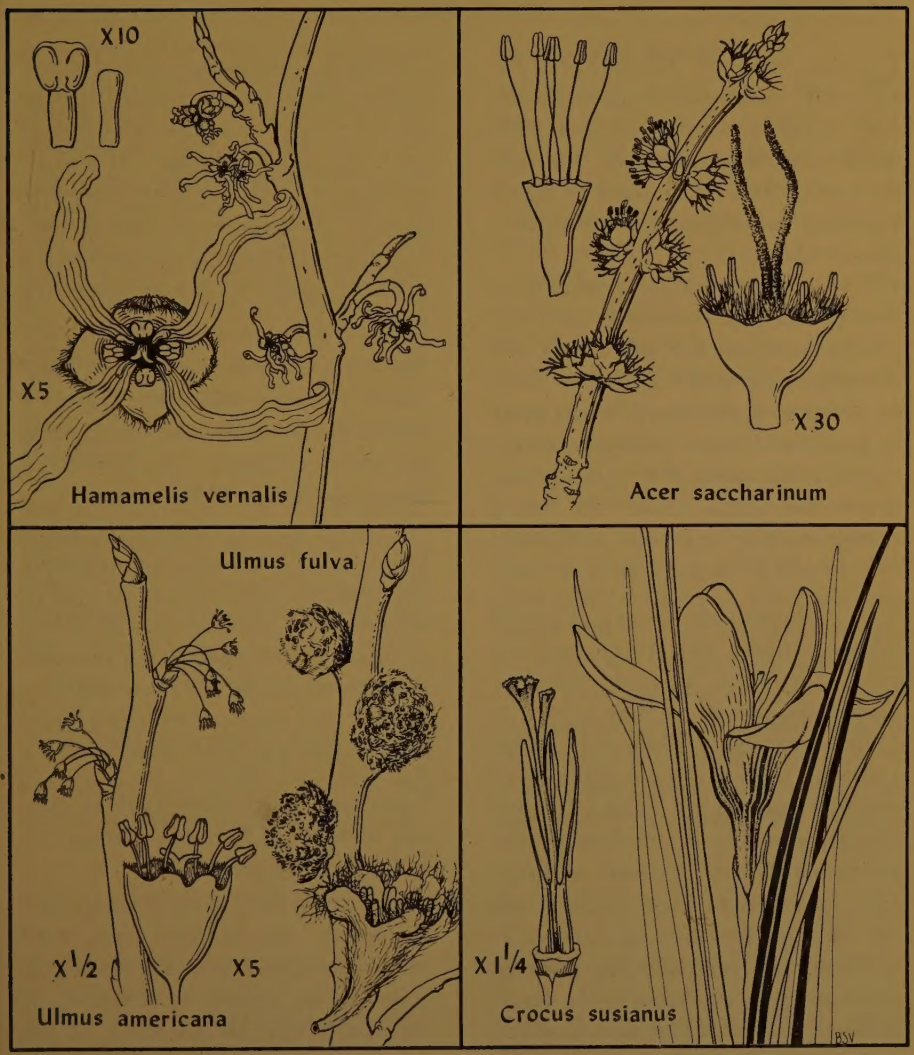
Though they may not look it at first sight, different kinds of flowers are built up out of the same kinds of units. If you really want to understand them and to find out about them from books, you will have to learn nearly as many technical terms as you did when you first learned to drive an automobile. Here, in the accompanying chart, is THE ABSOLUTE MINIMUM. There are twelve terms that you really must know: sepal, calyx, petal, corolla, stamen, carpel, pistil, filament, anther, ovary, style, stigma.

Study the chart carefully. Most educated people know that the *corolla* is made up of *petals*. In just the same way the *calyx* is made up of *sepals* and the *pistil* is made up of *carpels*. When you see the words, "carpel" or pistil" in a book and do not understand them, look at this simple chart. Just as a corolla is made up of petals, either separate or fused together, so a pistil is made up of carpels which may be more or less separate or so fused that you will have to hunt very carefully to find any evidence of individual carpels. (Words in brackets are less useful to the amateur.)

PARTS OF THE FLOWER AND THEIR NAMES

(FROM THE OUTSIDE INWARDS)

NAME OF UNIT	NAME FOR THE WHOLE CYCLE	NAMES FOR THE PARTS
Sepal	Calyx	———
Petal	Corolla	[Tube, Limb]
Stamen	[Androecium]	Filament, Anther
Carpel	Pistil	Ovary, Style, Stigma



Hamamelis vernalis (Ozark Witch Hazel). Flowering branch, enlarged flower and stamen and staminode. Blooms from December to April along water courses in central and southern Missouri. Petals Old Gold to Chinese Red. Fragrant. Old leaves tending to persist through the winter.

Acer saccharinum (Silver Maple) *X½*. Male and female flowers mostly on separate trees though sometimes mingled on one branch as illustrated here. Male flower upper left. Blooms from February to early May along river banks and bottom lands throughout Missouri.

Ulmus americana (American Elm) and *Ulmus fulva* (Slippery Elm). The flowers of these two species are much more distinctive than the leaves. Those of the Slippery Elm are borne in dense clusters from large, rusty-brown, wooly buds. Blooms from March to early May in rich soil.

Crocus susianus (Crocus) *ca. natural size.* At left the three stamens and the much-branched style and stigma which are characteristic of the Iris family, to which the crocus along with Gladiolus and Blue-eyed Grass belongs.

BOOKS TO USE

Spring Flora of Missouri by Julian A. Steyermark, Missouri Botanical Garden, St. Louis, and Field Museum of Natural History, Chicago, St. Louis, 1940. Reprinted by Lucas Brothers, Publishers, Columbia, Missouri, 1954.

This is a flora of Missouri written as simply and non-technically as it is possible to write and still satisfy the demands of scientists as well as those of the general public. Line drawings in black and white illustrate nearly every native spring flower except the grasses and sedges. The cloth bound edition is out of print and it is available now only in paper back reprint.

Gray's Manual of Botany, Eighth Edition, largely rewritten and expanded by M. L. Fernald, American Book Company, New York, 1950.

Although pretty large to be called a manual, this work is one volume and can be carried in the hand. It gives concise, scientific descriptions of the native flora from Missouri eastward and northward to New England and the Maritime provinces of Canada. It is much too technical for ordinary amateurs, yet a challenge to the extraordinary, some of whom have mastered its technicalities with no outside help.

Wildflowers of Missouri, by T. C. Rickett, Missouri College of Agriculture Circular 363, Columbia, Missouri, 1937. Second edition, revised and edited by E. M. Palmquist and C. L. Kucera, Missouri Handbook Number 3. The University of Missouri, Columbia, Missouri, 1954.

Here is a wildflower guide written in clear, easily understandable language by the wife of a former professor at the University of Missouri. It is illustrated with black and white reproductions of photographs of wild flowers. The original circular proved to be very generally useful to the amateurs of the state.

The New Britton and Brown Illustrated Flora of the Northeastern United States and Adjacent Canada, by Henry A. Gleason, The New York Botanical Garden, 1952.

This is a work as technical as Gray's Manual and covering approximately the same area, consisting of three large volumes with excellent line drawings of all the native plants and a few cultivated ones which have run wild.

An annotated Catalogue of the Flowering Plants of Missouri, by Ernest J. Palmer and Julian A. Steyermark, Annals of Missouri Botanical Garden 22: 375-758, September 1935.

The entire flora of the state are catalogued in this technical book, with precise notes as to the distribution of each species, county by county. It contains a valuable discussion of the geographical distribution of plants in Missouri which should be largely intelligible to any amatuer.

Manual of Cultivated Plants, by L. H. Bailey, The MacMillan Co., New York, 1949.

If he is interested in garden plants, this fat little book will answer more of the amateurs questions about the kinds

of plants than any other. It has an unusually full index of common names. Though it is written in technical botanical style it is so clear that most amateurs are able to find their way through it. There is an unusually good glossary explaining the meaning, not only of technical terms, but of the scientific names of plants. "Scandens," for instance, means "climbing" and when we see a plant listed as *Celastrus scandens* we may immediately know that it is most probably a climbing plant. The manual is partially illustrated.

The Geography of the Ozark Highland of Missouri, by Carl O. Sauer, published for the Geographical Society of Chicago by the University of Chicago Press, Chicago, Illinois, 1920.

Professor Sauer, one of the greatest living geographers, wrote this book as a young man about his native state and those parts of it which he had known as a boy and studied as a graduate student. A combination of history, geology, and geography.

Manual of Cultivated Trees and Shrubs, 2nd edition, by Alfred Rehder, The MacMillan Company, New York, 1940.

This is a technical compendium for all the woody plants (trees, shrubs and vines) native or introduced into the temperate and sub-temperate parts of the United States. It contains technical keys and descriptions, enumerations of the outstanding varieties of woody ornamental plants and dates of introduction into cultivation; and is one of the world's finest reservoirs of useful information. It is amazing that one man should have been able to complete it in his lifetime. Every amateur should look through this book to realize (as few amateurs do) the amazingly large number of plants which have been brought into cultivation by man, and the incredible amount of information about them which has been gathered into books like this one.

SWEET PEAS, PEA PODS, AND THE PA-PIL-I-ON-A-CE-OUS LE-GU-MIN-O-SAE

If you want to understand something important and interesting about the flowers of almost any part of the world, one of the easiest ways to learn a little in a short time is with a few Sweet Pea flowers plus half a dozen pea pods from the grocery store. Plants not only are of many different species but these species are classified in groups aptly termed Families. Knowing something about plant families is the easy route to knowing something about many kinds of plants in many parts of the world. By and large, however, this is a rather technical kind of thing to know and few amateurs find their own way into the problem. If there is any route easier than the Sweet Pea-pea pod route, no one has found it yet. Not only is it an easy one but it takes you immediately into an understanding of one of the world's most important

families of plants, the Leguminosae, particularly the sub-family known in technical terms by the impressive, mouth-filling phrase of Papilionaceous Leguminosae — Pa-pil-i-on-a-ce-ous Le-gu-min-o-sae.

Scientific terms are frequently so long and so different from everyday speech as to frighten away the ordinary amateur. Occasionally, however, a term turns up which is so perfectly terrible that it is as much fun to learn as a nursery rhyme. If you want to learn something useful and at the same time acquire an air of erudition, spend a few hours with the Sweet Peas and their interesting relatives and you will be able to talk with real understanding about *Pa-pil-i-on-a-ce-ous Le-gu-min-o-sae* such as Wisteria, Clover and Black Locust.

Begin with the Sweet Pea blossom with its strange butterfly shape. Use a fading flower, if possible, whose petals are getting ready to fall. You can gently pull out all five of these curiously formed objects. They are of three sorts. One stands up with a crease down its middle where it was folded, tentlike, over the whole blossom when it was in the bud stage. This petal is called the STANDARD (an old word for a flag). On either side (mirror images of each other like two cupped hands) are the so-called WINGS. These petals each have two curious flanges at the base, one hitches the petal to the base of the flower, the other engages like a patent catch with other parts of the blossom. The two other petals are more or less stuck together into a little boat-shaped object at the base of the bloom and they are aptly termed the KEEL. (See illustration page 42,)

The Sweet Pea, in other words, in spite of its air of fantasy, is not so different from the ordinary Buttercup or Wild Rose. It too is made up of five petals but unlike all buttercups and all roses one of these is specialized into a standard, two are wings with curious flanges at the base, and two (more or less adhering to each other), form the keel.

After we have removed the petals from a Sweet Pea flower, the remaining portion is not very easy to see because it is rather small; but anyone with good eyesight can make out the fact that most of the stamens are united over a good part of their length into a sort of little white shirt and one of the stamens is completely separate. After you have familiarized yourself with these facts it is better to turn to the pea pods from the grocery store. (see illustration page 42.) They came from a very similar kind of blossom, a little smaller, to be sure, than the average Sweet Pea but with a standard, two wing and two keel petals, and with nine stamens webbed together and one separate (you'll find them all dried up but still hanging together down next to the calyx). When the seed-bearing portion of the flower begins to develop it grows to many times its original size and becomes big enough to analyze with the naked eye. The PISTIL in the center of the flower is shown to be made up of two parts which open up when the seed is ripe, displaying one row of seeds which hang

from the two inner edges of the joined CARPELS. Such a seed pod is known technically as a LEGUME. The LEGUMINOSAE, therefore, are those plants whose seeds are borne in LEGUMES.

Most of the Leguminosae which we see in the temperate zone have flowers like the Sweet Pea as well as pods like pea pods. With their bright colors and graceful petals they have reminded many people of butterflies; since the classical word for butterfly is PAPILIO, what could be more natural than to refer to such legume-bearing butterfly-flowered plants as Papilionaceous Leguminosae?

If you will look carefully at a REDBUD flower you will find that though the blooms remind you of a tiny Sweet Pea in a general sort of way, they do not fold up into a bud quite like the Sweet Pea bud. The keel petals are only vaguely like a keel, the wing petals do not have complicated flanges; they do, indeed, belong to the Non-papilionaceous Leguminosae, and are closely related to many of the dazzling flowering trees of the tropics, many of which have strange leaves something like the curious leaf of the Redbud. The Redbud bears, among other distinctions, the honor of being Missouri's commonest non-papilionaceous legume!

The Leguminosae not only have distinctive flowers, they are distinctive in other ways. If you learn to recognize them by the flowers, you will understand many other things as well. Their leaves and leaflets have special little valves, or PULVINI, at the base which permit them to move about more rapidly than do the leaves of most other plants. The Sensitive Plant or Mimosa is a Legume related to the Acacias and other tropical non-papilionaceous legumes. It is the pulvini at the bases of mimosa leaves and leaflets which make them close up when the plant is touched. It is the pulvini on the common white clover which close up the clover leaf at night so that the two side leaflets are pressed close together and the middle one folds down over them like a tent. If you want to see a most peculiar sight, turn a flash light (or the headlights of your car) on a Black Locust tree at night and see the way the leaves are all folded up.

Another characteristic of this unusual plant family is its ability to go into partnership with soil microoraganisms and get nitrogen out of the air and into useful proteins. All our best meat substitutes come from the Leguminosae: beans, peas, lentils, pulses, chick peas, Korean lespedeza, soy beans. The Leguminosae play an important role in our diet and in that of our farm animals; we are just beginning to understand how important they are as game foods; we are learning to use them effectively in building up our soils. All the clovers, all the alfalfas, all the vetches are Pa-pil-i-o-na-cae-ous Le-gu-min-o-sae.

SPRING-FLOWERING LEGUMES OF FIELD AND GARDEN

Cladrastis (Yellow Wood)
Laburnum (Golden Chain Tree)
Lathyrus odoratus (Sweet Pea)
Lupinus (Lupine)
Medicago (Alfalfa)
Melilotus (Sweet Clover)
Robinia hispida (Rose Acacia)
Thermopsis (Banner Plant)
Trifolium (Clover)
Wisteria (Wisteria)

SPRING-FLOWERING LEGUMES
NATIVE TO MISSOURI

Amorpha (Lead Plant)
Astragalus (Ground Plum)
Baptisia (Wild Indigo)
Cercis (Redbud)
Gleditsia (Honey Locust)
Glycerrhiza (Wild Liquorice)
Gymnocladus (Kentucky Coffee Tree)
Lespedeza virginica (Bush Clover)
Oxytropis (Locoweed)
Petalostemum (Prairie Clover)
Psoralea (Psoralea)
Robinia (Black Locust)
Schrankia (Sensitive Briar)
Stylosanthes (Pencil Flower)
Tephrosia (Goat's Rue)
Vicia (Vetch)
Wisteria (Wisteria)

REDBUDS AND THE HISTORY OF THE OZARK FLORA

A perceptive naturalist, visiting southern Missouri for the first time is impressed by two things—the strange plants peculiar to the Ozarks and the strange aspect of well-known plant species. From New England to New York State to Michigan the Sugar Maples are much the same; but come to the Ozarks and you find them more variable. Here they tend to hold their leaves in the winter in a fashion unknown in the North and East. They are smaller, wartier, scragglier, more picturesque trees than other Sugar Maples. Similarly, as one comes in from the East, the Red Cedars are seen to be shorter, more variable and with larger berries, the Hepaticas and Dutchman's Breeches appear much brighter in color. The Flowering Dogwood grows in more exposed situations and has denser masses of bloom. The common red-and-yellow Columbine is a taller and more branched plant than it was back in Pennsylvania and New York; and its sepals are more greenish and frequently have a strong keel down the middle of them.

These are variations which have been studied at the Missouri Botanical Garden by the students and staff during the last thirty years. Some have been studied in great detail, as in Dr. Woodson's statistical analysis of what has been happening to the Butterfly Weeds.

We now have a fairly simple explanation for many of the disturbances of the Ozark flora. The story is most easily demonstrated for our Redbuds. One does not need to have a very sharp eye to note, as he travels westward in the early spring, that the Redbuds vary somewhat in color from one bush to another, while as one travels towards the east they become more and more uniform. From Tennessee and Kentucky to the Eastern States, Redbuds are pretty much the same kind of tree, growing in the same kind of place. When masses of them are in full bloom the interlacing flowering branches of adjacent trees cannot be distinguished by their color, or the size of the flowers, or the branching pattern of the twigs. But, drive westward out of St. Louis on Route 66 and you will see a very different kind of evidence. Even when they are all in full bloom the Redbuds are not quite the same color and some bushes are conspicuously very dark, others very light. If you stop your car and examine some of them you will find examples which are growing side by side whose flowers are so

different that you can quite easily distinguish the two, even when the branches are interlacing.

As you drive west towards Springfield, Missouri, this tendency becomes more and more conspicuous. If you know the Redbud well in the East you will be surprised to find Redbuds growing in brighter, sunnier and rockier spots than they did there; and an occasional plant will have larger and more tightly bunched blossoms than those you knew before. Many of these bushes, even when grown to blooming size, will be no taller than a man.

To find the explanation of this variation one has merely to drive on westward until he comes to the Arbuckle Mountains in central Oklahoma. Here is a hybrid swarm of Redbuds, the like of which cannot be found in any other part of the world. The Texas Redbud, a shorter, bushier tree with leathery leaves and brilliant, big flowers has hybridized for many years with the common Eastern Redbud; the Arbuckles are populated with their mongrel descendants. Flowers vary from deep pink to almost white, from large to small, from petals all of one color to diverting specimens whose upper petal will be dark pink, the side ones white and the basal pair pale pink.

If one then drives on farther West the country becomes drier and drier, the stands of Redbud fewer and farther between, the influence of the Eastern Redbud less and less discernable until it dies out altogether and one finds isolated colonies of Western Redbud. Our Ozark Redbuds owe their variability to their slightly mongrel ancestry. Some thousands of years ago at a time when the climate here was drier, the Texas Redbud spread farther up this way and there was a good deal of hybridizing. As the climate became more moist again the Texan species was at a disadvantage and finally died out; but in drier and rockier places Redbuds with a little Texan ancestry were at an advantage, particularly during spells of extreme drought such as those of the last decade.

This Redbud story, which is now being studied in detail at the Garden, seems to be typical of many Ozark plants. A few thousand years ago in the Xerothermic (hot-dry) period, the climate was much drier than at present. Conditions in the Ozarks then were much like those of central Oklahoma today. At such times the Eastern Red Cedar hybridized with the Mexican Red Cedar, the common Sugar Maple with the Caddo Canyon drought-resistant maple, the Columbine with one of its south-western relatives. When better times brought back a climate not so different from that of Kentucky and Tennessee, the desert vegetation retreated but some of its mongrelized descendants lingered on. Today if one goes to the rocky, west-facing and south-facing limestone glades in the Garden's Gray Summit Arboretum he can see Redbuds, Sugar Maples, Red Cedars, and Columbines all growing together, all different from their relatives in the East, all with measureable resemblances to south-western species. If you have got to live on a dry Missouri hillside and you come from an old Eastern family, one grandfather or great grandfather from Texas is a real asset.

SPRING FLOWERS NATIVE TO MISSOURI

	NAME	MARCH	APRIL	MAY	JUNE
1	*Sanguinaria canadensis* (Bloodroot)	1			
2	*Amelanchier canadensis* (Shad Bush)	2			
3	*Cercis canadensis* (Redbud)	3			
4	*Dentaria laciniata* (Toothwort)	4			
5	*Dicentra Cucullaria* (Dutchman's Breeches)	5			
6	*Erigenia bulbosa* (Pepper and Salt)	6			
7	*Hepatica acutiloba* (Liver-leaf)	7			
8	*Houstonia minima* (Small Bluets)	8			
9	*Isopyrum biturnatum* (False Rue Anemone)	9			
10	*Leavenworthia uniflora* (Leavenworthia)	10			
11	*Claytonia virginica* (Spring Beauty)	11			
12	*Erythronium albidum* (White Dog-tooth Violet)	12			
13	*Erythronium mesochoreum* (Prairie Dog-tooth Violet)	13			
14	*Nothoscordum bivalve* (False Garlic)	14			
15	*Viola papilionacea* (Common Violet)	15			
16	*Viola pedata* (Bird's-foot Violet)	16			
17	*Lithospermum canescens* (Orange Puccoon)		17		
18	*Myosurus minimus* (Mousetail)		18		
19	*Polemonium reptans* (Jacob's Ladder)		19		
20	*Stylophorum diphyllum* (Celandine Poppy)		20		
21	*Uvularia grandiflora* (Bellwort)		21		
22	*Viburnum rufidulum* (Black Haw)		22		
23	*Astragalus distortus* (Bent Milk Vetch)		23		
24	*Camassia scilloides* (Wild Hyacinth)		24		
25	*Delphinium tricorne* (Dwarf Larkspur)		25		
26	*Mertensia virginica* (Bluebells)		26		
27	*Phacelia Purshii* (Miami Mist)		27		
28	*Phlox divaricata* (Blue Phlox)		28		
29	*Aquilegia canadensis* (Wild Columbine)		29		
30	*Arisaema Dracontium* (Green Dragon)		30		
31	*Arisaema triphyllum* (Jack-in-the-pulpit)		31		
32	*Dodecatheon Meadia* (Shooting Star)		32		

LISTED IN ORDER OF COMING INTO BLOOM

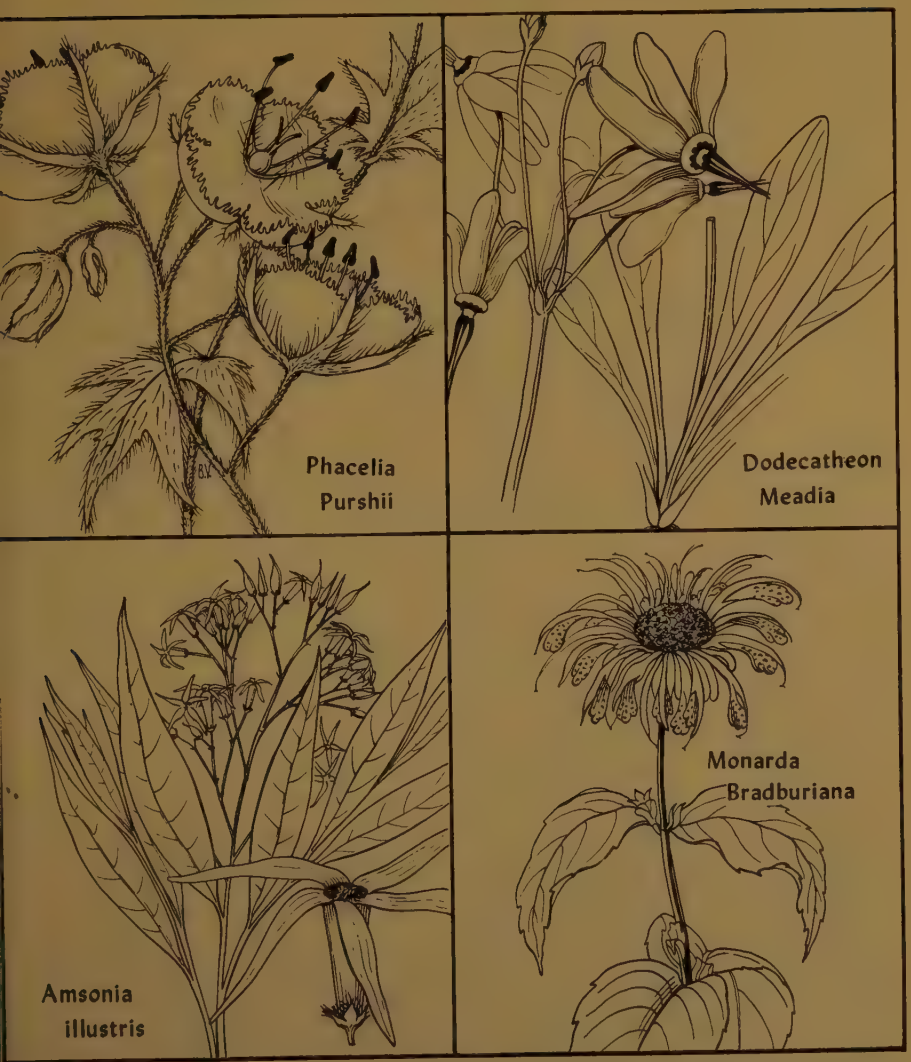
	NAME	APRIL	MAY	JUNE	JULY
33	*Iodanthus pinnatifidus* (Purple Rocket)	33			
34	*Viola striata* (Pale Violet)	34			
35	*Arenaria patula* (Sandwort)	35			
36	*Astragalus mexicanus* (Larger Ground Plum)	36			
37	*Clematis Fremontii* (Fremont's Leather Flower)	37			
38	*Cornus florida* (Flowering Dogwood)	38			
39	*Hydrophyllum appendiculatum* (Woollen Breeches)	39			
40	*Nemastylis acuta* (Northern Nemastylis)	40			
41	*Tradescantia virginiana* (Spiderwort)	41			
42	*Iris virginica* (Southeran Blue Flag)	42			
43	*Scutellaria parvula* (Skullcap)	43			
44	*Amsonia illustris* (Amsonia)	44			
45	*Coreopsis lanceolata* (Tickseed Coreopsis)		45		
46	*Monarda Bradburiana* (Horsemint)		46		
47	*Oenothera missouriensis* (Missouri Primrose)		47		
48	*Tradescantia canaliculata* (Spiderwort)		48		
49	*Delphinium carolinianum* (Carolina Larkspur)		49		
50	*Penstamen Digitalis* (Beard-tongue)		50		
51	*Echinacea pallida* (Cone-flower)		51		
52	*Echinacea paradoxa* (Cone-flower)			52	
53	*Saturaia glabra* (Ozark Calamint)			53	
54	*Rosa setigera* (Climbing Rose)			54	
55	*Asclepias tuberosa* (Butterfly Weed)			55	
56	*Petalostemum purhureum* (Purple Prairie Clover)			56	
57	*Ratibida pinnata* (Prairie Coneflower)			57	
58	*Vernonia altissima* (Ironweed)			58	
59	*Cephalanthus occidentalis* (Buttonbush)			59	
60	*Monarda fistulosa* (Wild Bergamont)			60	
61	*Veronicastrum virginicum* (Culver's-physic)			61	
62	*Asclepias verticillata* (Whorled Milkweed)			62	To Sept.
63	*Campsis radicans* (Trumpet Vine)			63	To Sept.
64	*Houstonia angustifolia* (Summer Bluet)			64	To Sept.

Amelanchier canadensis (Shad Bush) *natural size*, leaf *X½*. Blooms from mid-March to mid-April in open or rocky woods and bluffs throughout Missouri; the flowers appearing before leaf buds open. At a distance it resembles wild plum, but blooms earlier in rockier places and has more graceful branches than plum.

Viola pedata (Wild Pansy, Bird's-foot Violet) *ca. natural size*. The form with upper petals velvety deep purple (upper right), is commoner in the St. Louis area than the plainer form with all petals of soft gray-blue. Late-March to May in sour soils in woods, glades and prairies throughout Missouri.

Uvularia grandiflora (Bellwort) *ca. half natural size*. Flowers drooping and frequently appearing as if wilted or unopened. Sepals and petals colored alike, deep or pale yellow. Leaves very graceful. Blooms in April in rich woods on slopes of ravines or bluffs, or wooded bottom land, throughout Missouri.

Camassia scilloides (Wild Hyacinth) *ca. half natural size*. Sepals and petals colored alike, a soft, gray-blue. The slender stamens give the tall spikes an airy grace. Blooms April to May, prairies, open woods, glades and rocky open slopes, mostly on limestone in eastern, southern, and central Missouri.

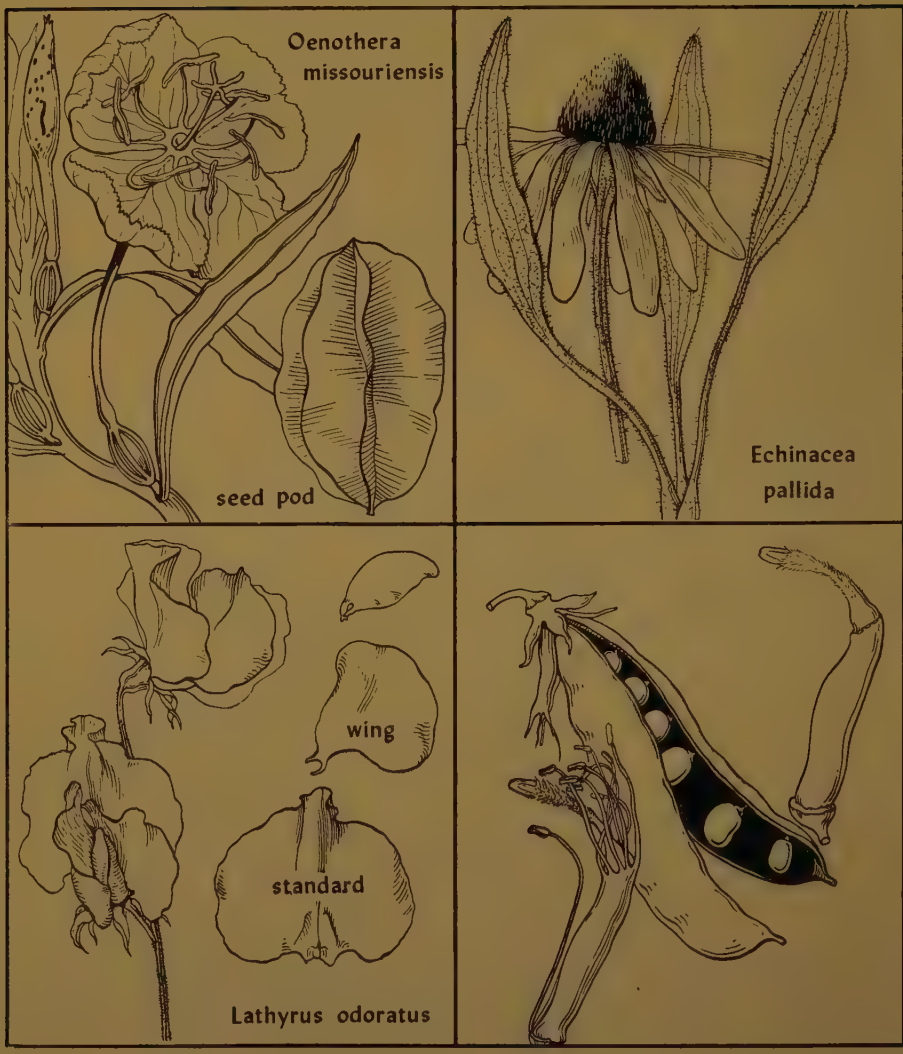


Phacelia Purshii (Miami Mist) X2½. Flowers soft, bluish-white, delicately fringed. The closely related *Phacelia gilioides* is darker blue and is found in rockier places from Franklin Co. westward and southward. Blooms April to mid-May in moist open woods, alluvial thickets and open places in eastern Missouri.

Dodecatheon Meadia (Shooting Star) *ca. natural size.* Flowers intense pink to white, sweet-scented. Very variable in color and color pattern in the Ozarks. Blooms April and May in prairies, glades, bluffs, and moist wooded slopes in eastern, central and southern Missouri.

Amsonia Illustris (Amsonia) X½, detail X1½. Plants form dense clumps (unlike their relatives in the East). Flowers are shades of gray-blue and white, the color of old-fashioned Canton china. Blooms mid-April to mid-June in rocky open places and gravel bars of streams in central and southern Missouri.

Monarda Bradburiana (Horsemint, Bee Balm) X½. The only common Bee Balm which blossoms in the spring. Flowers bright pink to almost white, attractively spotted, sweet-scented. Blooms May and early June in open rocky woods, thickets and glades in eastern, central and southern Missouri.



Oenothera missouriensis (Missouri Primrose) X⅓. Flowers opening in the late afternoon, soft primrose yellow, as large as saucers. Seed pods (lower right, X½) turn grayish as they ripen and look almost like wooden lilies when they open up. Blooms May and early June on limestone glades and rocky outcrops in central and southern Missouri.

Echinacea pallida (Cone-flower) X½. Varies in color from deep pink to almost white. Frequently grows in dense clusters of hundreds of plants. Blooms late-May and June in rocky prairies, glades and open woods throughout Missouri.

Lathyrus odoratus (Sweet Pea) X½. A typical papilionaceous legume (see page 33). Petals at right, standard below, wing in the middle, keel petal above.

Legume. Lower left: pistil of a sweet pea (greatly enlarged) showing the surrounding nine webbed stamens and one separate stamen, stigma pointed to the left. Center: pea pod X½; note webbed dried-up stamens still clinging to pod. Upper right: pistil of sweet pea with free ends of stamens cut away.

OZARK WILDFLOWERS AND OZARK LANDSCAPES

Saint Louis is not only a meeting place of different floras, it is a meeting place of quite different landscapes. The Ozarks begin just west and south of the city limits; the Glaciated Plains of northern Missouri and of Illinois fade out (technically at least) within the metropolitan area. Though the last of the great glacial advances was halted much farther north, earlier ones from the east and from the north reached our boundaries before dying out.

The Ozarks are a flat-topped low plateau of ancient limestones and sandstones whose northern border (as shown in the map on the cover) runs from St. Louis to Joplin. The Ozarks take in a small area in northeastern Oklahoma and extend across northern Arkansas where they meet the southern coastal plain, whose curving edge comes past Poplar Bluff to end at Cape Girardeau. Then the broad, flat, flood plain of the Mississippi River serves as the eastern boundary of the Ozarks to the very edge of metropolitan St. Louis. Along their southern border in Arkansas, the Ozarks are joined by the Boston Mountains, a high, flat, steep-sided mesa only recently accessible by first class roads.

The ancient limestones and sandstones of the Ozarks, lying one on top of another like a stack of gigantic dinner plates, have warped only a little in the ages since they were deposited. In only one part of Missouri, the St. Francois Mountains, have they been worn through to the ancient granites and porphyries on which they rest. These are scarely more than stumps of mountains, mostly low, whale-backed ridges a few hundred feet above the valleys from which they rise, though at least one of them, Pilot Knob, is really mountain-shaped, as if one small feature of Yellowstone National Park had accidentally been dropped down, a hundred miles south of St. Louis.

To those who were born and bred in other parts of the country, these little mountains are sometimes a blessed relief. They form soils which are so acid that at times the whole flora resembles spots in the East and North. The Southern Yellow Pine *(Pinus echinata)* is common there; Azaleas *(Rhododendron nudiflorum* var.*roseum)* fill some of the woodlands; in early spring the clear-watered streams which form granite gorges (known locally as "shut-ins") are lined with graceful bushes of Alder *(Alnus rugosa)*.

Not that the Ozarks are not fascinating country in their own strange way. They were uplifted in what was, geologically speaking, just yesterday; and the rivers, which used to meander across a flat coastal plain, now have cut down narrow steep-sided valleys leaving frequent spectacular cliffs of weathered limestone which remind one of canyons much farther westwards. Over much of the Ozarks the hills have been leached away for so long that no limestone is left along the hill tops. The soil there is full of tiny chunks of virtually insoluble chert (impure flints) which was once included in the limestone. Since chert makes a rather acid soil many of these hills have lime-loving plants at their bases and lime-hating plants along ther ridges, as over much of Jefferson county where the Blue Phlox *(Phlox*

divaricata) fills the valleys and the pink Phlox *(Phlox pilosa)* is mainly on the ridges.

Some of the limestones in the Ozarks are thin-bedded dolomites which weather into "glades". These rocky areas ooze water all winter and spring when most plants would like good drainage and turn hot and dry in the middle of the summer when plants want all the water they can get. Species which are really happy in such a situation are rare indeed and these glades have a curious flora which can at times be most spectacular. There grows the Purple Coneflowers *(Echinacea pallida)* in various shades, the Missouri Primroses *(Oenothera missouriensis)* with their pale yellow blooms as wide as bread-and-butter plates, and the summer Bluets *(Houstonia angustifolia)* so delicate that one wonders how such dainty flowers could blossom through rainless summer weeks in such exposed places.

Throughout most of the Ozarks there is so much limestone, and limestone is so soluble, that many water channels have been disolved-out deep underground. There are few brooks that have water in them all the year round but there are frequent caves and many springs, some of them really astonishing in size and beauty, where the underground brooks and rivers come to the surface.

Near St. Louis there is only one layer of rock, the St. Peter's Sandstone, which is not strongly alkaline. Along the Crystal Escarpment where this soft white sandstone comes to the surface there are many little canyons and gorges. The lack of lime, the sandy texture of the soils, and the shade of the steep-sided canyons attract another set of plants from those common in the rest of the landscape. Here one may find the Partridge Berry *(Mitchella repens)* with its evergreen leaves, tiny, pink flowers and spongy, red berries which last all winter, as well as many other rare and interesting plants. Near St. Louis the Crystal escarpment is most marked from Crystal City (where the sandstone is used for glass-making) to Pacific where imposing cliffs of it can be seen crowding up to the northern edge of the highway. North of the Missouri River it outcrops in beautiful wooded valleys near Marthasville, turning eastward to cross the Mississippi River near Winfield but not until it has produced spectacular examples of folded rock strata along highway 79.

Erigenia bulbosa. (See inside front cover).

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical Garden (the official name chosen by Mr. Shaw) carries on the garden established by Henry Shaw over a century ago at TOWER GROVE, his country home. It is a private institution and has no support from city or state. The old stone walls and cast-iron fences, the Linnaean House, the Museum, the Mausoleum, and the TOWER GROVE mansion all date from Mr. Shaw's time. Since his death, as directed in his will, the Garden has been in the hands of a Board of Trustees who appoint the Director.

The Garden is open every day in the year (except New Year's and Christmas) from nine A. M. until seven P. M. spring to fall and until six in the winter time though the greenhouses close at five. TOWER GROVE, itself, Mr. Shaw's old country home, is open from one until four, admission twenty-five cents, with special guides. The Garden is nearly a mile long and has several entrances. The Main Entrance, the one most used by the general public, is at Tower Grove and Flora Place on the Sarah bus line (No. 42). The Park Southhampton buses (No. 80), direct from downtown, pass within three blocks of this entrance and stop directly across the street from the Administration Building at 2315 Tower Grove Avenue. The latter is the best entrance for students, visiting scientists, etc. It is open to such visitors after 8:30 A. M., but is closed on Saturdays, Sundays, and holidays. The step-in gate (more or less concealed by the big Cleveland Ave. gate, 2221 Tower Grove) is nearly always open, and there is a service entrance on Alfred Avenue, one block south of Shaw Avenue.

Since Mr. Shaw's time an Arboretum has been developed at Gray Summit, Mo., adjacent to State Highways 50 and 66. It is open every day in the year and has auto roads as well as foot trails through the wild-flower reservation. There is a pinetum and an extensive display of daffodils and other narcissi which are at their best in April.